

ABSTRACT

A copper damascene structure formed by direct patterning of a low-dielectric constant material is disclosed. The copper damascene structure includes a tungsten nitride barrier layer formed by atomic layer deposition using sequential deposition reactions. Copper is selectively deposited by a CVD process and/or by an electroless deposition technique.

$\frac{d}{dt} \left(\frac{\partial L}{\partial \dot{x}} \right) = \frac{\partial L}{\partial x}$